

BREEDING BEHAVIOR OF BELL'S VIREO IN ILLINOIS

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DURING the late spring and summer of 1939 we made observations on the nesting of Bell's Vireo (*Vireo belli*) at Urbana, Champaign County, Illinois. This study, while extending from May 24 to July 29, was based on necessarily brief, but regular, observations totalling approximately 35 hours. Five nests belonging to two pairs were located on the south campus of the University of Illinois. Most of the observations were made on four nests of one pair which confined its activities to a grassy area of approximately three acres containing scattered patches of shrubby fruit trees and several masses of shrubs (*Rosa* and *Ribes*). This location is referred to as area "A" (Figures 1 and 2). Supplementary observations were made on the nest of a second pair whose home area ("B") was separated from area A by a distance of

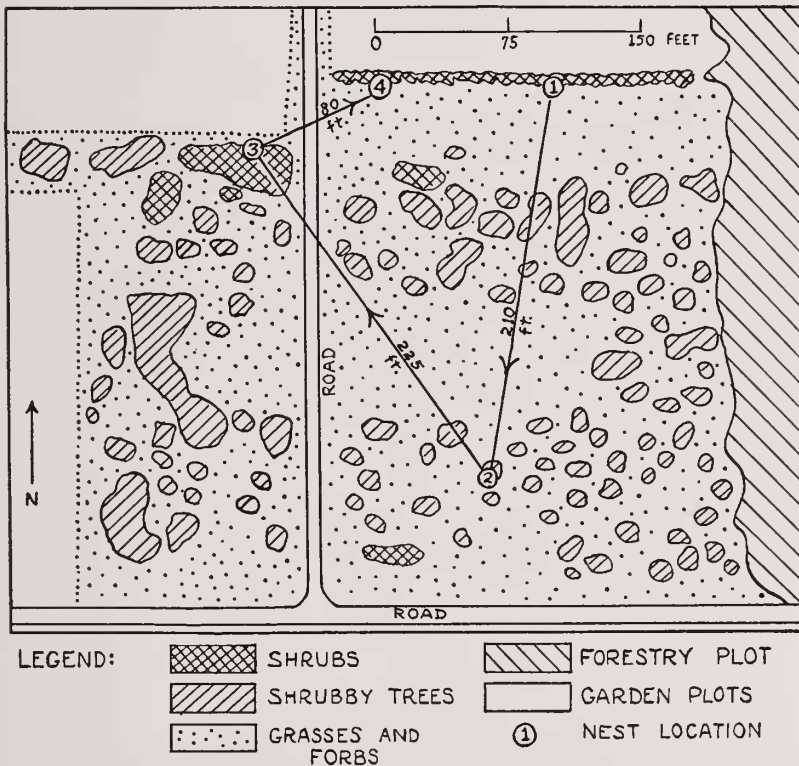


Figure 1. Map of area A, showing vegetational characters of the habitat and location of the four nests. Distances between successive nests are indicated.



Figure 2. Scene in area A, facing northeast. The apple tree at left center contained nest 2. The higher trees of the forestry plot are seen in the background.

approximately 500 feet over open, tilled garden plots to the north of area A. The edge of a dense forestry plot connected the two areas (Figure 1), but no Bell's Vireos were noted along here during the period of breeding activities.

SUMMARY OF NESTING EVENTS

The day-to-day developments in the nesting efforts of pair A are summarized below. Apparently the same two birds of area A remained there throughout the breeding period. Members of a pair were distinguished only by a certain behavior traits (song of male, scolding and wariness of female, etc.; see Nice, 1929).

NEST 1

- May 26—11 A.M. Nest contained one egg. Female on nest.
 7 P.M. Female on nest.
 27—Eggs 1 and 2, plus a Cowbird (*Molothrus ater*) egg. Male noted incubating.
 28—Nest contained only a Cowbird egg. Nest deserted.
 29—No further developments.
 30—Nest and egg collected.

NEST 2

- June 2—Nest contained one egg.
 3—Eggs 1 and 2, plus a Cowbird egg.
 4—Egg 2 gone; egg 1 and 3, plus two Cowbird eggs. Nest deserted.
 5—No further developments; nest with two vireo eggs and two Cowbird eggs collected (Figures 2 and 3).

NEST 3

- June 7—Nest incomplete; interior included some large leaves and lacked a smooth lining.
8—Nest lined with grasses.
9—No activity about nest.
10—Egg 1, plus a Cowbird egg. Female on nest.
11—Eggs 1 and 2, plus a Cowbird egg.
12—Eggs 1, 2, and 3, plus a Cowbird egg.
13—9 A.M. Eggs 1, 2, 3, and 4, plus a Cowbird egg.
6 P.M. Only eggs 1, 3, and 4, plus a Cowbird egg; nest deserted.
14—8:55 A.M. Egg 3 missing.
15—6 P.M. Egg 4 missing (no earlier visits).
16—No further developments; nest with one vireo egg and one Cowbird egg collected.

NEST 4

- June 14—Adult carrying nesting material at new location.
15—Male singing vigorously at new location.
16—Nest incomplete.
17—Nest contains one Cowbird egg; lining appears thin and incomplete.
18—One vireo's egg; Cowbird egg slightly imbedded in lining indicating addition of material subsequent to its appearance.
19—Eggs 1 and 2, plus a Cowbird egg.
20—Eggs 1, 2, and 3, plus a Cowbird egg.
July 3—Eggs 1 and 2 hatched.
14—Two young leave nest; nest and remaining eggs collected (Figure 4).

LENGTHS OF PHASES OF THE NESTING CYCLE

The nest-building period was determined to be four days in the case of the fourth nest. On the basis of intervening periods between nests No's 1 and 2 and later No's 2 and 3, the building periods for nests No's 2 and 3 were four and five days, respectively. Nice (1929: 16) reports a period of six days.

Our observations show that incubation began on the day that the first egg was laid (Lewis, 1921: 32; Simmons, 1925: 250). The female was noted at that time on nests No's 1, 3, and 4. In fact, the premature appearance of a Cowbird's egg in nest No. 4 apparently stimulated the female to incubate before the nest was completely lined and one day before her first egg appeared. Lining material was added to that nest so that the Cowbird's egg was partially buried; but on the other hand, its presence apparently hindered the female from adding as complete a lining as she had in earlier nests. The male was noted incubating at nest No. 1 after the appearance of the second egg.

In nest No. 4, eggs 1 and 2 hatched 14 days after laying of the second egg. A similar incubation period was recorded by Nice (1929: 13). The intervals between the laying of the last egg of one nest and the first egg of the next nest (area A) are extracted from the above summary as six, six, and five days, respectively. Between May 26 and June 20 (26 days), the female of pair A laid a total of twelve eggs. (All observa-

tional evidence suggests that the same birds remained on area A throughout the breeding period, but this was not proven conclusively. No additional vireos were seen there at any time).

In nest No. 4, nestling life lasted eleven days.

COWBIRD PARASITISM

Bell's Vireo is commonly parasitized by the Cowbird (Friedmann, 1929: 237). Three of our five nests were deserted probably because of Cowbird activities; from the other two, young were fledged. Nice (1929)



Figure 3. Nest No. 2 with two Vireo eggs and two Cowbird eggs. Inside diameter of nest, 4.5 cm.; outside diameter, 7 cm. The nest was two feet above the ground in an apple tree.

records nine nests of Bell's Vireo all of which were known to be unsuccessful, seven due to Cowbird parasitism. Bennett (1917) records twelve nests, three of which were unparasitized and successful; seven of the remaining nine nests were parasitized. Thus, out of a total of

26 nests mentioned here, only five were successful; of the 21 unsuccessful nests, 17 were failures apparently because of Cowbirds.

In our observations five Cowbird eggs were laid in the four nests of pair A. None of these hatched. The nest of pair B, observed with three young on July 11, apparently was not parasitized.

Bell's Vireo may desert when the Cowbird adds its eggs to the nest (Lantz, 1883). Other individuals of this species, as in our observations,



Figure 4. Adult Bell's Vireo at nest No. 4. The nest was 30 inches above the ground.

may tolerate the added eggs and may accept them even if they appear before the host's first egg, as in nest No. 4, but desert when an egg is removed. Still others may continue to attend a nest containing only

eggs of the Cowbird (Bennett, 1917: 286, 292). This type of variation has been noted within other species, also (Friedmann, 1929: 193; Pitelka, 1940: 6).

While we did not succeed in observing a Cowbird at or about any of the nests, the general circumstances of egg removal lead us to suggest that at least at nests No's 1 and 2, one female was responsible. At nest No. 1, both eggs of the host were taken; at nest No. 2, one egg was taken. Removal of eggs commenced after the appearance of the first and (in nest No. 1) only Cowbird egg, and probably occurred during the day that the Cowbird added its egg. In any case no eggs were removed before or at the time of laying.

At nest No. 3, three eggs were removed on successive days. Removal commenced three days after the appearance of the Cowbird egg. The first egg was taken between 9 A.M. and 6 P.M.; the second egg was taken on the following day before 8:55 A.M. In his study of molothrine parasitism of the Ovenbird (*Seiurus aurocapillus*), Hann (1941: 220) found removal to occur usually in the forenoon of the day of laying or on the preceding day. He regards a one-day lapse between appearance of the Cowbird egg and removal of a host's egg as rare. A three-day lapse occurred in removal of eggs from nest No. 3. It is still possible, but unlikely, that a Cowbird was responsible.

At nest No. 4, a Cowbird egg was added one day ahead of the first vireo egg. If the female Cowbird appeared to remove a host's egg following the laying (before 9 A.M.) of its own, the effect of the absence of any vireo eggs may have been such that the Cowbird did not reappear, and the fourth nesting was then completed successfully.

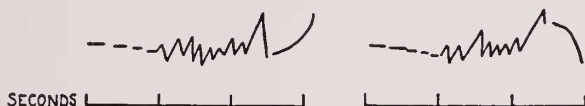
PARENTAL BEHAVIOR

The period of nest building was marked by increased attention of the male towards the female. The male followed the female about almost continually, singing more frequently and with greater vigor than at other times of the breeding cycle. The female apparently built the nests unaided. Nice (1929: 16) states that the male may or may not assist in nest building. Both sexes incubated and both fed and brooded young. Nice (1929) and DuBois (1940) report similar observations. The sexes of other species of Vireonidae show similar relations in care of nest and young. The variation noted in the behavior of the male Bell's Vireo (Nice, 1929) is illustrated also in the Black-capped Vireo (*Vireo atricapillus*), the males of which may or may not participate in incubation (Lloyd, 1887: 295; Bunker, 1910: 72).

SONG

The song as heard in central Illinois was almost identical with that recorded during earlier observations in southern Texas (Pitelka, 1938).

It is an irregular series of harsh and sharp, but slurred notes preceded by a few distinct notes of the same quality and ended with a decidedly ascending or descending note of similar harshness. Each song usually last three seconds. Two characteristic performances may be patterned as follows:



The notes are loud, emphatic, and unmusical. The last part of the song is loudest. Notes of the Rough-winged Swallow (*Stelgidopteryx ruficollis*), though less loud, are similar in quality.

As in other Vireonidae, a subdued version of the song may be given, and the male may sing intermittently during attentive periods on the eggs. Spaulding (1937: 22) states, however, that the male of Latimer's Vireo (*V. latimeri*) in Puerto Rico does not sing on the nest.

On July 2 (last day of incubation), the male sang 98 times during an early morning period of 1½ hours (6:22-7:50 A.M.). This averages approximately a song per minute, but as many as four or five songs were given per minute during brief periods of more frequent singing. Earlier in the breeding cycle, singing occurs more frequently (Nice, 1929: 13, 17). The male was noted to respond to the female with song during or following her scolding notes; this occurred when he was away from the nest as well as on the nest.

On July 2, Koestner recorded an exchange of place on the nest when, as the male left, the female approached and sang twice. The occurrence of female song in this species was not ascertained further (although suggestive evidence had been recorded on June 22 and 26). Song in female vireos has been reported in three other species: *V. atricapillus* (Lloyd, 1887: 295), *V. philadelphicus* (Lewis, 1921: 33), and *V. latimeri* (Spaulding, 1937: 18). In our observations and those of Lewis (1921: 33, 37), circumstances accompanying the singing by the female suggest that the song may function as a signal prior to exchange at the nest (Pitelka, 1940: 15). Spaulding, however, did not record female song beyond the courtship and nest building periods.

NEST PARASITES

Both incubating adults and young apparently suffer infestation by the northern fowl mite, *Liponipsus sylviarum* (Can. & Franz.). On July 2, the adult bird on nest No. 4 pecked and scratched its breast while on the nest. The mites were numerous on the following day when

the young hatched. A heavier infestation was recorded at the nest of pair B, containing three young on July 11; on July 14, two young left the nest and a third was found dead in the nest. On July 15, the rim of this nest and adjoining twigs were covered with "thousands" of mites which dropped to the ground in a continual little shower.

OCCURRENCE AND BREEDING SEASON IN ILLINOIS

In 1939, Bell's Vireo was first recorded on area A on May 17 (J. Murray Speirs). The male on area B was first noted on May 28 (Pitelka). The extreme dates of occurrence of this species in Champaign County are May 1 (Smith, 1930: 116) and September 5 (our records). (The male of pair A was last recorded singing on the home area on July 29; a male, probably that of pair B, remained singing on area B through September 5).

Previous nesting records for the state include those of Cory (1909) and Hess (1910). Eggs have been recorded from May 26 (our records) to July 4 (Hess, 1910: 29).

In east-central and northern Illinois, Bell's Vireo is apparently uncommon and local in distribution, but it is more numerous in the western and southern parts of the state. As a regular resident, the species ranges farthest east in the region of the prairie peninsula of central and northern Illinois.

HABITAT RELATIONS

The habitat occupied by the Bell's Vireos under our observation (Figures 1 and 2) was similar to sites described by other observers in Illinois (e.g., Hess, 1910: 29). The other resident species within area A were: Mourning Dove (*Zenaidura macroura*), Alder Flycatcher (*Empidonax traillii*), Catbird (*Dumetella carolinensis*), Brown Thrasher (*Toxostoma rufum*), Yellowthroat (*Geothlypis trichas*), Goldfinch (*Spinus tristis*), and Field Sparrow (*Spizella pusilla*). All of these are more or less characteristic of forest edge and growths of shrubs in this region.

In more arid portions of its range, such as western Nebraska and California, Bell's Vireo is confined largely to canyon-bottom and riparian shrub growths (Cary, 1901: 46; Grinnell and Storer, 1924: 515). Yet during field studies about Laredo, Texas (Pitelka, 1938), the species was noted in patches of mesquite (*Prosopis*) scattered over dry, open uplands.

Niche limitations confine Bell's Vireo to a low stratum of vegetation for nesting sites and food (Grinnell and Storer, 1924: 515). Individuals are seldom seen above six or seven feet in shrubby vegetation and their flights are usually made low over openings between thicket patches. As Grinnell and Storer have pointed out, other Vireonidae occurring in the same region as *V. belli* forage considerably above the six-foot level. But it is instructive to note a similarity of habitat of this and

other shrub-inhabiting vireos in areas where their ranges overlap. In southern Illinois, Ridgway (1873: 119) found Bell's Vireo within the same thickets as the White-eyed Vireo (*Vireo griseus*). In central Oklahoma, Bunker (1910: 72) found Black-capped Vireos nesting in the same thickets as Bell's Vireo. The study of interspecific relations among closely related forms occupying similar habitats has hitherto been neglected. Each of the two examples just mentioned provides an excellent opportunity to observers who are located favorably for such a study.

SUMMARY

During the summer of 1939, five nests of Bell's Vireo were studied in central Illinois. These consisted of three attempts at nesting and a fourth successful nesting of one pair together with one successful nesting of a second pair. Nest building lasted 4 to 5 days. Incubation began after laying of the first egg and lasted 14 days. Nestling life lasted 11 days. Cowbird interference was probably the cause of desertion of the first two, and possibly three, nests of one pair. At each of these nests, desertion occurred after removal of one host egg. Nest building was done by the female. Both sexes participated in incubation and care of young. The female may sing. In Illinois, Bell's Vireo occurs in orchard thickets and groves of shrubby deciduous trees. It is known to occur in similar or the same habitats as two other shrub-inhabiting species of *Vireo* in regions where their breeding ranges overlap.

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